

## Predictors of Outcome for Non-Operative Management of Localized Intra-Abdominal Infection "Abscess": A Prospective Study

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### ABSTRACT

**Background:** Interventional (percutaneous) drainage of abdominal abscesses is a safe and successful method of treatment that avoids many of the disadvantages of traditional surgical drainage.

**Objective:** This study aimed to evaluate factors associated with success or failure for non-operative management of localized intra-abdominal infection "abscess". **Patients and Methods:** This is a prospective single arm descriptive study that has been conducted at Sohag University Hospital from June 2017 to August 2018. This study included 100 patients presented with intra-abdominal localized collection during the period of the study, from June 2017 to August 2018, and presented to Sohag University Hospital, with any sex, age, previous abdominal surgery or clinical presentation.

**Results:** In our studied population, 85 cases of total 100 cases had spontaneous abscesses without any previous abdominal surgeries. 52 cases of them responded successfully to non-operative management while 33 failed. 64 cases of total 100 cases responded successfully to non-operative management, 25 % of them were appendicular/post appendectomy abscesses, 21.88% were liver abscesses, 21.88% were iliopsoas/ iliopsoas and perinephric abscesses. To be noticed that all 14 cases (11 iliopsoas and 3 iliopsoas and perinephric abscesses) responded successfully to non-operative management by 100%. Out of 29 diabetic patients with intra-abdominal abscess, 26 cases of them responded to non-operative management while only 3 cases of them needed surgical intervention. **Conclusion:** Diabetes mellitus and positive culture of aspirate are predictors for success of non-operative management while high grade fever is predictor for failure.

**Keywords:** Intra-abdominal abscess, Localized intra-abdominal collection, Percutaneous drainage, Pig tail.

### INTRODUCTION

The management of sepsis remains a significant challenge for health professionals. The Surviving Sepsis campaign, an effort to improve outcomes from sepsis launched in 2004 and sponsored by major critical care societies across the world, estimates that severe sepsis and septic shock affects millions every year <sup>(1)</sup>. Statistics from England support this, showing that over 120 000 patients develop sepsis each year and more than 37 000 of these die, making sepsis the second most common cause of death after cardiovascular disease <sup>(2)</sup>. Some 22 percent of all patients with severe sepsis or septic shock in the International Multicentre Prevalence Study on Sepsis (IMPreSS), a recent international point prevalence audit of sepsis care, had an abdominal source <sup>(3)</sup>. Percutaneous drainage "as non-operative management" is a well-accepted procedure for the treatment of intra-abdominal and intrapelvic abscesses. The use of this technique may help obviate more costly and time-consuming surgical procedures. In addition, results in lower mortality rates in comparison with those obtained with surgical drainage <sup>(4, 5)</sup>. Surgeons have a significant contribution to make with regard to sepsis, because they play a central role in the management of patients in whom a decision whether for surgical procedure or non-operative management may be needed for source control <sup>(6, 7)</sup>. The aim of the present study was to evaluate factors associated with success or failure for non-operative management of localized intra-abdominal infection "abscess" and clarify different modalities of this management.

### PATIENTS AND METHODS

This is a prospective single arm descriptive study that was conducted at Sohag University Hospital from June 2017 to August 2018. This study includes 100 patients presented with intra-abdominal localized collection during the period of the study, from June 2017 to August 2018, and presented to Sohag University Hospital, with any sex, age, previous abdominal surgery or clinical presentation.

**Inclusion criteria:** All patients with intra-abdominal localized collection presented to Sohag University Hospital pre or post any abdominal surgery.

**Exclusion criteria:** Patients with generalized intra-abdominal peritoneal infection "free intraperitoneal collection" was excluded from the study.

### Ethical consideration:

The study protocol was approved by Ethical Committee of Sohag Faculty of Medicine. All official permission letters were taken from director of the Surgery Department before start in the data collection. The study purpose and treatment were carefully explained to the patients individually. Then they were consented to participate in the study. They were allowed to ask questions freely to ensure that they had understood.

### All patients were subjected to:

A full history data were taken from all patients including items of the personal history as name, age,



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occupation, marital status, and number of offspring if married. Analysis of the complaint of the patient was taken with optimum care, and the arrangement of events was discussed in details for each patient. The past history for each patient was discussed by details; history of a disease, history of a previous operation, if found, what kind of the operation and when and where this operation was done. After completing the history, examination of the patient was performed. First, general examination of the patient; if the patient looked ill or well, had average body built or was underweight, which would give us some sort of guidance about the nature of septic condition if it's localized or complicated.

After completing this general examination, systemic examination was undertaken; all body systems were examined, including chest, heart, head and neck, upper and lower limbs to detect any abnormalities or positive findings that could be related to the patient main manifestations. When completing all the previous data, a detailed abdominal examination of the patient was carried on with fulfilling all items; including inspection of the abdomen to detect any visible swellings affecting the abdomen or fistulous openings.

Each mass palpated and felt by palpation was observed carefully to detect the accurate site and size and shape of this mass and the texture of this mass if it was solid, cystic, firm, soft, or hard, and its shape if regular or irregular. Special signs for examination of any mass would be detected such as fluctuation and pulsation or expansile characters. After all the previous history and complete examination of the patient had the intra-abdominal abscess, we transferred to the investigations; firstly, laboratory investigations such as CBC, complete coagulation profile, liver function tests, and renal function tests, all were documented.

Another valuable item is radiological investigations; all possible radiological investigations over the abscess/localized collection in concern were performed and documented for each patient such as ultrasonography, CT, MRI.

#### **Procedure of non-operative management:**

After performing all the previous, a space was left for the procedure, which was performed to manage the case if medications with therapeutic aspiration if single or repeated aspiration, sonar guided drainage via intraperitoneal catheter placement at site of abscess.

In most cases, first of all, diagnostic aspiration was done for analysis/microbiological evaluation then if the collection wasn't grossly frank suppurative collection, complete aspiration would be the appropriate choice for follow up ultrasonography. In case of relatively clear diagnosis about suppurative collection and planning for intraperitoneal catheter placement, a simple paracentesis was best performed under ultrasound guidance, however obtaining a CT scan before the procedure often provides a more detailed view of deeper components to the collection and for planning a safe access route. Thicker fluid was best drained with larger-caliber catheters. A 10- to 14-French catheter provided adequate drainage for most abscesses.

#### **Post procedure care and follow up:**

All patients who had therapeutic aspiration with medications or sonar guided intraperitoneal catheter placement were admitted at hospital for strict follow up for at least 48 hours up to two weeks if needed.

These patients were examined for vital signs: pulse, temperature, blood pressure and respiratory rate every 8 hours and this was documented. Another clinical examination was performed twice daily for local abdominal palpation and percussion if any signs of generalized peritonitis appeared.

Patients who had intraperitoneal catheter placement, had special care for follow up of amount of collection drained each night, nature of fluid if changed, daily sterile surgical dressing at site of drain and follow up abdominal ultrasonography frequently for assessment of residual size of abscess, any developing lesions appear or any free peritoneal collection appears .

#### **Statistical analysis**

Data was analyzed using STATA version 14.2 (Stata Statistical Software: Release 14.2 College Station, TX: StataCorp LP.). Quantitative data were represented as mean, standard deviation, median and range. Data were analyzed using student t-test to compare means of two groups. When the data were not normally distributed Mann-Whitney test was used. Qualitative data were presented as number and percentage and compared using either Chi square test or Fisher exact test. ROC curve analysis was used to detect area under curve (AUC). P value was considered significant if it was less than 0.05.

The relationships between each variable and patient outcomes were tested using univariate analysis. Univariate logistic regression analysis was performed to calculate the odds ratios and corresponding 95% confidence intervals. Variables with P values, 0.20 on univariate analysis were entered into multivariate logistic regression analysis to search for independent factors predictive of outcomes. A stepwise procedure was used for model selection with entry and retention levels of 0.05 significance.

#### **RESULTS**

In this study the age of the patients ranged from 3 years old up to 75 years old, and the study included 100 patients, 56 of them were males while 44 were females as demonstrated in table 1.

Most of intra-abdominal abscesses were presented as one lesion abscess in our studied population (79 cases). From all studied population, only 15 % were postoperative abscess formation while others were spontaneous 85%. 100 studied cases showed 29 diabetic cases, 12 hypertensive cases and 3 cases with chronic liver diseases. About 38 % of cases were with +ve growth culture for different G +ve, G -ve and anaerobic organisms, while about 62% of cases were of -ve growth or detection of any bacteria or organisms. None of all 100 cases were recorded to be associated with fistula (Table 1).



**Table (1): Demographic characteristics and pre procedural variables**

Variable	Summary statistics
<b>Age/years</b>	
Mean±SD	45.02±19.34
Median (range)	52 (3-75)
<b>Gender</b>	
Females	44 (44.00%)
Males	56 (56.00%)
<b>Number of lesions</b>	
One	79 (79.00%)
Two	18 (18.00%)
Three	3 (3.00%)
<b>Cause of the lesion</b>	
Spontaneous	85 (85.00%)
Postoperative	15 (15.00%)
<b>Leucocytic count</b>	
Mean ± SD	14.97±3.06
Median	15
<b>Hemoglobin level (g/dL)</b>	
Mean ± SD	10.63±1.88
Median	10.8
<b>Platelet count (mcL)</b>	
Mean ± SD	309.20±35.03
Median	323
<b>Creatinine (mg/dL)</b>	
Mean ± SD	0.99±0.09
Median	0.83
<b>Diabetes mellitus (mg/dL)</b>	
No	71 (71.00%)
Yes	29 (29.00%)
<b>Hypertension (mm Hg)</b>	
No	88 (88.00%)
Yes	12 (12.00%)
<b>Liver disease (μL)</b>	
No	97 (97.00%)
Yes	3 (3.00%)
<b>Cardiac insufficiency (ng / L)</b>	
No	94 (94.00%)
Yes	6 (6.00%)
<b>Malignancy</b>	
No	94 (94.00%)
Yes	6 (6.00%)
<b>Culture of aspirate (cfu/mL)</b>	
Negative	62 (62.00%)
Positives	38 (38.00%)
<b>Temperature</b>	
Mean ± SD	38.19±0.60
Median	37.9
<b>Obstructive symptoms</b>	
No	82 (82.00%)
Yes	18 (18.00%)
<b>Associated GIT pathology</b>	
No	42 (42.00%)
Yes	58 (58.00%)
<b>Parietal inflammatory reaction</b>	
No	97 (97.00%)
Yes	3 (3.00%)

Non-operative management was considered successful when patient infection resolved without the need for surgery. Failure of non-operative management was defined as clinical worsening that needed urgent surgery.

In our studied population, 85 cases of total 100 cases were spontaneous abscesses without any previous abdominal surgeries. 52 cases of them responded successfully to non-operative management while 33 failed. 64 cases of total 100 cases responded successfully to non-operative management. About 37 patients with appendicular/post appendectomy abscess

were treated with non-operative management, 21 cases of them needed surgical intervention and failed as non-operative management while other 16 cases responded to non-operative management. 79 cases were diagnosed with 1 lesion "one abscess cavity", 49 cases showed success with non-operative management, 30 cases showed failure of non-operative management. 29 diabetic patients had intra-abdominal abscess, 26 cases of them responded to non-operative management while only 3 cases of them needed surgical intervention (Table 2).

**Table (2):** Relation between clinical outcome and different variables

Variable	Clinical outcome		P value
	Success N=64	Failure N=36	
<b>Age/years</b> Mean $\pm$ SD Median (range)	48.13 $\pm$ 18.09 55 (3:75)	39.5 $\pm$ 20.48 44 (7:70)	0.03
<b>Gender</b> Females Males	29 (45.31%) 35 (54.69%)	15 (41.67%) 21 (58.33%)	0.72
<b>Diagnosis</b> Appendicular/Post appendectomy Liver abscess Iliopsoas/ Iliopsoas and perinephric Others	16 (25.00%)  14 (21.88%) 14 (21.88%) 20 (31.25%)	21 (58.33%)  6 (16.67%) 0 9 (25.00%)	<0.001
<b>Number of lesions</b> One Two Three	49 (76.56%) 15 (23.44%) 0	30 (83.33%) 3 (8.33%) 3 (8.33%)	0.02
<b>Cause of the lesion</b> Spontaneous Post-operative	52 (81.25%) 12 (18.75%)	33 (91.67%) 3 (8.33%)	0.16
<b>Leucocytic count</b> Mean $\pm$ SD Median	15.51 $\pm$ 3.80 15.2	14.03 $\pm$ 3.38 14.05	0.35
<b>Hemoglobin (g/dL)</b> Mean $\pm$ SD Median	10.69 $\pm$ 1.86 10.85	10.53 $\pm$ 1.94 10.7	0.69
<b>Platelets (mcL)</b> Mean $\pm$ SD Median	303.59 $\pm$ 46.87 325.5	319.17 $\pm$ 12.20 314.5	0.99
<b>Creatinine (mg/dL)</b> Mean $\pm$ SD Median	0.94 $\pm$ 0.04 0.83	1.09 $\pm$ 0.09 0.85	0.88
<b>Diabetes mellitus (mg/dL)</b> No Yes	38 (59.38%) 26 (40.63%)	33 (91.67%) 3	<0.001

The results of the univariate analysis for comparison of the predictors (demographic characteristics, pre-procedural variables) with clinical outcomes are reported in table 3.

**Table (3):** Univariate logistic analysis of predictor of failure

Variable	Odds ratio (95% confidence interval)	P value	AUC
Age/years	0.98 (0.96:0.99)	0.04	0.63
Male gender	1.16 (0.51:2.65)	0.73	0.52
Others type vs appendicular	0.23 (0.10:0.57)	0.001	0.67
Two/three vs one	0.65 (0.23:1.87)	0.43	0.53
Postoperative vs Spontaneous	0.39 (0.10:1.50)	0.17	0.55
Leucocytic count	0.96 (0.89:1.02)	0.25	0.56
Hemoglobin	0.96 (0.77:1.19)	0.69	0.52
Platelets	1.00 (0.99:1.00)	0.58	0.50
Creatinine	1.52 (0.77:3.03)	0.22	0.51
Diabetes mellitus	0.13 (0.04:0.48)	0.002	0.66
Hypertension	0.56 (0.14:2.20)	0.40	0.53
Cardiac insufficiency	1.84 (0.35:9.68)	0.46	0.52
Positive culture of aspirate	0.40 (0.16:0.99)	0.048	0.60
Temperature	2.43 (1.19:4.95)	0.01	0.67
Obstructive symptoms	2.04 (0.72:5.72)	0.18	0.55
Associated GIT pathology	3.19 (1.30:7.85)	0.01	0.63

Multivariate analysis showed that temperature was the single independent predictor of failure. DM was a predictor of success as well as positive culture of aspirate was a predictor of success.

**Table (4):** Multivariate logistic analysis of predictor of failure (include significant variable in univariate)

Variable	Odds ratio (95% confidence interval)	P value
Age/years	0.08 (0.92:1.00)	0.08
Others type vs appendicular	0.43 (0.12:1.56)	0.20
Medium/large vs small	0.18 (0.02:1.26)	0.09
Diabetes mellitus	0.17 (0.03:0.85)	0.03
Positive culture of aspirate	0.07 (0.01:0.50)	0.009
Temperature	6.80 (1.88:24.57)	0.003
Associated GIT pathology	3.51 (0.88:21.22)	0.07

DM and positive culture of aspirate were independent factors for successful outcome of non-operative management while high temperature was independent factor for failure of non-operative management as demonstrated in table 5.

**Table (5):** Final model logistic analysis of predictor of failure (include significant variable in univariate)

Variable	Odds ratio (95% confidence interval)	P value
Diabetes mellitus	0.06 (0.01:0.31)	<0.0001
Positive culture of aspirate	0.08 (0.02:0.45)	0.004
Temperature	10.16 (2.93:35.25)	<0.0001

## DISCUSSION

Intra-abdominal abscesses are common diseases that affect many patients, they may be solitary or multiple abscesses, palpable or non-palpable lesions at time of examination. Etiologically; they may be spontaneous, postoperative and rarely to be presented as a complication of neoplastic mass <sup>(8,9)</sup>.

In our study, a group of 100 patients with variable types of intra-abdominal abscesses were studied. Patients were on all age groups; age ranged here from 3 years to 75 years. In our study, intra-abdominal abscesses affected males more than females with a small higher percentage.

In another study by **Khurrum et al.** <sup>(10)</sup>, the presentation differs from patient to another, but presentation of an intra-abdominal abscess at different locations of the abdominal cavity was mainly presented by about 42%. Their main complaint was just acute abdominal pain, about 26% their main complaint was fever with abdominal pain and about 21% their main complaint was repeated vomiting with abdominal pain and 11% other presentations in comparison with 97% presented patients with pyrexia.

At the time of presentation, a mass could be seen on inspecting the abdomen at about 18% of patients and felt on palpation of the abdomen at about 42% of patients while 7.5% of patients of **Khurrum et al.** <sup>(10)</sup> were presented as abdominal mass.

To identify the abscess as a mass seen or felt via abdominal examination, radiological investigations have to be done, Ultrasonography is an easy and convenient method to determine the presence or absence of intra-abdominal lesions and is the modality of choice in the routine work up of any intra-abdominal mass and it is useful for differential diagnosis between different types of intra-abdominal cystic lesions with its characteristic imaging findings. In our study, sonar was done for all cases because of the previous advantages; it was diagnostic for the intra-abdominal abscesses found.

Recent development of multi-detector CT technology allowed high resolution body imaging, it allowed to differ multiple abscesses from each other and can also evaluate peritoneal pathology and also it is very effective in determining the dimensions of the intra-abdominal abscess <sup>(11)</sup>.

These inconsistent results in the literature make it necessary to clearly identify the causes of failed percutaneous drainage of postoperative abscess. The search for predictive factors of outcomes is a critical issue because failed percutaneous drainage results in prolonged hospital stays with accompanying increased hospital costs. Failed percutaneous drainage may require a repeated procedure and ultimately surgery. Predicting the failure of percutaneous drainage would result in a more timely appropriate effective surgical treatment <sup>(11)</sup>.

As regard etiology, postoperative abscesses were present in 15% of patients while they were present in 53% of patients in the study of **Cinat et al.** <sup>(12)</sup>.

Solitary abscesses were detected in 79% of patients in comparison to 83% of **Cinat et al.** <sup>(12)</sup>.

Our results confirm also that non-operative management is a safe, effective, and well-tolerated management for patients with intra-abdominal abscesses. In our study, the success rate of non-operative management was 64% while 70% was the primary success rate of **Cinat et al.** <sup>(12)</sup>.

Only 2 independent predictive factors were detected for favorable outcome of non-operative management; DM and positive culture of aspirate, while one independent predictive factor was detected for non-favorable outcome, which was high temperature of the patients with intra-abdominal abscesses.

## CONCLUSION

Non operative management of localized intra-abdominal collection "abscess" is safe and effective method in both sonar guided aspiration or intra-abdominal drain insertion with success rate 64%. Clinical and radiological follow up is mandatory in such cases. Both DM and positive culture of aspirate are predictors for success while increased temperature is a single predictor of failure.

## REFERENCES

1. **Dellinger R, Levy M, Rhodes A et al. (2013):** Surviving Sepsis Campaign. Crit Care Med., 41: 580–637.
2. **Soop M, Carlson G (2017):** Recent developments in the surgical management of complex intra-abdominal infection. British Journal of Surgery, 104(2): 65-74.
3. **Rhodes A, Phillips G, Beale R et al. (2015):** The Surviving Sepsis Campaign bundles and outcome: results from the International Multicentre Prevalence Study on Sepsis (the IMPReSS study). Intensive Care Med., 41: 1620–1628.
4. **Golfieri R, Cappelli A (2007):** Computed tomography-guided percutaneous abscess drainage in coloproctology: review of the literature. Tech Coloproctol., 11:197–208.
5. **Politano A, Hranjec T, Rosenberger L et al. (2011):** Differences in morbidity and mortality with percutaneous versus open surgical drainage of postoperative intra-abdominal infections: a review of 686 cases. Am Surg., 77:862–7.
6. **Sartelli M, Catena F, Ansaloni L et al. (2012):** Complicated intra-abdominal infections in Europe: a comprehensive review of the CIAO study. World J Emerg Surg., 7: 36-42.
7. **Mudgal M, Shomar R, Kardishan B et al. (2010):** surgical Anatomy, Abdomen and pelvis. Indian Journal of Surgery, 36: 205-212.
8. **Lambert W, Wineski L (2010):** Lippincott's Illustrated QandA Review of Anatomy and Embryology. Lippincott Williams and Wilkins, PP. 240. <https://www.bookdepository.com/Lippincotts-Illustrated-Q-Review-Anatomy-Embryology-H-Wayne-Lambert/9781605473154>
9. **Li X, Zhang J, Sang L et al. (2010):** Laparoscopic versus conventional appendectomy—a meta-analysis of randomized controlled trials. BMC Gastroenterol., 10:129-135.
10. **Khurrum Baig M, Hua Zhao R, Batista O et al. (2002):** Percutaneous postoperative intraabdominal abscess drainage after elective colorectal surgery. Tech Coloproctol., 6:159–64.
11. **Kassi F, Dohan A, Soyer B et al. (2013):** Predictive factors for failure of percutaneous drainage of postoperative abscess after abdominal surgery. Am J Surg., 207(6):915-21.
12. **Cinat M, Wilson S, Din A (2002):** Determinants for successful percutaneous image-guided drainage of intra-abdominal abscess. Arch Surg., 137:845–9.